

## CLAIMS

1. A method of detecting faults on a telephone line, the method comprising:  
comparing measured characteristics of the line with at least one model, said  
5 model(s) modelling expected characteristics of the telephone line; and  
in response to the comparison, generating a fault alert signal if the  
comparison between the measured characteristics and the modelled expected  
characteristics differ by more than a pre-determined threshold,  
wherein said characteristics comprise characteristics relating to the  
10 transmission of data on the line within a plurality of predetermined frequency bands.
2. A method according to claim 1 wherein a model models the expected  
characteristics at a pre-determined data rate.
- 15 3. A method according to claim 1 or 2 wherein the comparison involves a  
goodness-of-fit test.
4. A method according to claim 3 wherein the comparison involves calculating  
the Chi-squared statistic.
- 20 5. A method according to claim 3 or 4 wherein the comparison involves  
comparing the number of zeros in said pre-determined frequency bands for the  
measured and expected characteristics.
- 25 6. A method according to any one of claims 3 to 5 wherein the comparison  
involves calculating the sum of absolute difference between consecutive said pre-  
determined frequency bands.
7. A method according to any one of claims 3 to 6 wherein the comparison  
30 involves calculating the number of said pre-determined frequency bands the data for  
which is less than expected.

8. A method according to claim 7 wherein the comparison involves calculating the number of said pre-determined frequency bands the data for which is less than 50% of the expected.
- 5 9. A method according to any one of claims 3 to 8 wherein the comparison involves calculating the number of said pre-determined frequency bands the data for which is greater than expected.
- 10 10. A method according to claim 9 wherein the comparison involves calculating the number of said pre-determined frequency bands the data for which is 200% of the expected.
11. A method according to any preceding claim wherein the characteristics of the line represent the frequency distribution for data transmitted via the line.
- 15 12. A method according to claim 13 wherein the characteristics of the line represent the bin occupancy distribution of discrete multi tones.
13. A method according to any preceding claim wherein the telephone line is a  
20 Digital Subscriber Line.
14. A method of generating models for use in a method of detecting faults on a telephone line, the fault detection method comprising comparing measured characteristics of the line with a model, said model modelling expected  
25 characteristics of the telephone line, and in response to the comparison, generating a fault alert signal if the comparison between the measured characteristics and the modelled expected characteristics differ by more than a pre-determined threshold, the model generation method comprising:
- 30 receiving data representing characteristics of a telephone line; and  
forming a model which generally represents the received characteristics of the line,  
wherein said characteristics comprise characteristics relating to the transmission of data on the line within a plurality of predetermined frequency bands.

15. A method according to claim 14 further comprising forming a model for the characteristics of the line at a variety of bit rates.

5 16. A method according to claim 14 or 15 further comprising forming a model for the characteristics of the line for a subset of said pre-determined frequency bands.

17. A device for detecting faults on a telephone line, the device comprising:  
10 an input for receiving data from a line to be tested for faults;  
a processor for measuring characteristics of the data;  
a comparator for comparing the measured characteristics of the line with a model, said model modelling expected characteristics of a telephone line; and  
fault alert device for generating a fault alert signal in response to the  
15 comparison, if the comparison between the measured characteristics and the modelled expected characteristics differs by more than a pre-determined threshold  
wherein said characteristics comprise characteristics relating to the transmission of data on the line within a plurality of predetermined frequency bands.

20 18. A method for monitoring quality of a telephone line, the method comprising:  
comparing measured characteristics of the line with a model, said model modelling expected characteristics of the telephone line, the comparison step involving a goodness-of-fit test between the measured characteristics and the modelled expected characteristics, wherein said characteristics comprise  
25 characteristics relating to the transmission of data on the line within a plurality of predetermined frequency bands.

19. A method according to claim 18 wherein, in response to the comparison, generating a fault alert signal if the comparison between the measured characteristics  
30 and the modelled expected characteristics is statistically significantly different.

20. A method according to claim 18 or claim 19, further comprising periodically carrying out the comparison step over a period of time to monitor for changes in the characteristics of the telephone line over the period of time.